Determining the antecedents of dynamic supply chain capabilities

Article (Accepted Version)

Determining the Antecedents of Dynamic Supply Chain Capabilities

Abstract

Purpose: The purpose of this paper is to determine the antecedents of Dynamic Supply Chain Capabilities (DSCCs). We test entrepreneurial orientation and supply chain learning orientation as two antecedents of DSCCs.
Design: The paper uses structural equation modelling to test a hypothetical model. Data are gathered from a survey of 275 operations managers in Pakistan's turbulent manufacturing industry.
Research Implications: It is widely accepted that firms do not compete with each other, instead, it is end-to-end supply chains that fight for market dominance. Many scholars use the dynamic capabilities view to understand supply chain level competition. However, the dynamic capabilities view is firm-centric in its examination of how companies transform internal resources to compete in the external environment. The theoretical contribution of this paper is a roadmap of how to build dynamic, supply-chain level, capabilities by determining the key antecedents. This paper explains that DSCCs emerge when buyers and suppliers share strategic orientations. Firms with an entrepreneurial orientation and the ability to learn with supply chain partners are well positioned to develop DSCCs. This provides a new angle to theory testing by indicating that dynamic capabilities are enabled by an entrepreneurial orientation and an ability to learn with supply chain partners.
Practical implications: Managers are given the building blocks of DSCCs, starting with fostering an entrepreneurially oriented mind-set in the company and then learning with supply chain partners. Entrepreneurially oriented managers are encouraged to take risks, and co-develop innovative ideas with suppliers during the supply chain learning process.
Originality/value: This study is one of the earliest efforts to determine the strategic orientations that antecede the emergence of dynamic supply chain capabilities

Keywords: dynamic supply chain capabilities, entrepreneurial orientation, supply chain learning orientation, market sensing, supply chain agility, supply chain adaptability

1. Introduction

Supply chain managers are confronted by a turbulent business environment marked by intense competition and continuously changing consumer demand (Braziotis et al., 2013; Christopher & Holweg, 2011; Sauer & Seuring, 2018). Dynamic capabilities allow managers to compete in today's turbulent marketplace by rapidly reconfiguring the firm's resource base to achieve alignment with changing customer demand (Helfat & Winter, 2011; Teece et al., 1997; Winter, 2003). Dynamic capabilities are comprised of sensing, seizing and transforming capabilities (Teece, 2007). Sensing capabilities relate to a firm's capacity to sense and shape opportunities and threats. Seizing capabilities refer to a firm's capacity to seize opportunities once they are sensed. Transforming capabilities relate to a firm's capacity to maintain competitiveness over the longer term by enhancing and reconfiguring the firm's tangible and intangible resources (Teece, 2007).

Scholars have shown that dynamic capabilities can provide a competitive advantage in rapidly changing markets (Allred et al., 2011; Barreto, 2009). And, the factors that antecede the emergence of dynamic capabilities have been identified (Rothaermel and Hess, 2007). Yet, the dynamic capabilities view is firm-centric in its examination of how to transform internal resources to compete in the external environment (Schilke et al., 2017). The reality is that firms do not compete with each other, instead, it is their end-to-end supply chains that fight for market dominance (Christopher, 2000; Lee, 2004). With this reality in mind, the dynamic capabilities view has been extended beyond firm boundaries to examine how supply chain partners can achieve competitive advantage (Beske, 2012; Defee and Fugate, 2010). Dynamic Supply Chain Capabilities (DSCCs) are defined as "a learned pattern of cross-organisational activities that facilitate the creation of new static capabilities or the modification of existing capabilities across multiple supply chain members" (Defee & Fugate, 2010, p. 187). DSCCs allow supply

chain partners to sense and seize new opportunities by transforming supply chain design and infrastructure to achieve alignment with anticipated market shifts (Aslam et al., 2018).

DSCCs are comprised of market sensing, supply chain agility and supply chain adaptability capabilities (Aslam et al., 2018). A market *sensing* capability allows supply chain managers to develop a better understanding of the market situation, giving them a better chance of understanding and acting on uncertainties and market trends (Day, 1994). A market sensing DSCC is defined as a firm's ability to actively learn about customers, competitors, supply chain members and the business environment to allow for an understanding of market conditions as well as for prediction purposes (c.f. Morgan, 2012). Systematically undertaking market-sensing activities allows supply chain partners to remain synchronized with marketplace changes (Bharadwaj and Dong, 2013). Supply chain agility is defined as a firm's ability, in conjunction with its key suppliers and customers, to quickly and effectively react to changes in its environment (Blome et al. 2013, p. 1295). It is positioned as a *seizing* DSCC because supply chain partners collaborate to develop a flexible and agile supply chain infrastructure that can provide a short-term response to marketplace shifts (Aslam et al., 2018; Blome et al., 2013; Gligor & Holcomb, 2012). Supply chain adaptability is defined as the ability of supply chain partners to make fundamental and long-term supply chain design changes in the wake of sensed opportunities (Eckstein et al., 2015; Ketchen & Hult, 2007). Supply chain adaptability is positioned as a *transforming* DSCC, because the resource base and infrastructure of the supply chain is transformed over the longer term in response to changes in the marketplace (Aslam et al., 2018; Eckstein et al., 2015; Lee, 2004).

Supply chain scholars have examined how DSCCs affect a firm's operational performance (Ju et al., 2016), economic performance (Aslam et al., 2018), as well as social and environmental performance (Beske, 2012; Hong et al., 2018). However, the testing of the theoretical underpinnings of DSCCs, particularly its antecedents, is still in its infancy. This is

an important omission because managers will find it difficult to seize on new market opportunities without a roadmap of how to build DSCCs. Therefore, the purpose of this paper is to answer the question: *what are the antecedents of dynamic supply chain capabilities?*

We build the argument that when supply chain partners set out to co-develop DSCCs, they should first share a strategic orientation. When a firm and its suppliers are oriented to attain the same strategic objectives, they are better able to coordinate the reconfiguration of supply chain assets to achieve desired goals (Defee and Fugate, 2010). In this paper, an entrepreneurial and a supply chain learning orientation are positioned as two strategic orientations that antecede the emergence of DSCCs. Firms with strong dynamic capabilities are said to be intensely entrepreneurial and the ability to recognize new opportunities is said to depend on a manager's knowledge and learning capacities (Teece, 2007). Organizations acting entrepreneurially adjust their operations in dynamically competitive environments and shape that environment by committing resources to exploit uncertain opportunities (Covin and Slevin, 1989; Hakala, 2011; Renko et al., 2009). To reap the benefits of entrepreneurial efforts, scholars stress that an organization and its partners should be committed to continuous learning, open to new ideas, and orientated towards achieving a shared understanding of newly acquired knowledge (Sinkula, 1994; Slater & Narver, 1995; Wang, 2008). By extension, supply chain partners that act entrepreneurially and learn together are better able to reconfigure supply chain resources and seize on market opportunities when they arise. This paper provides a new angle to theory testing by indicating how dynamic capabilities are enabled by an entrepreneurial orientation and an ability to learn with supply chain partners

Data are gathered from survey of 275 operations and supply chain managers working in Pakistan's manufacturing sector. Pakistan is undergoing a significant period of economic change, with its gross domestic product (GDP) expected to grow at an annual rate of 6% for the next ten years, far outstripping western economies (Zahid, 2017). At the same time,

Pakistani manufacturing firms face increased competition as Chinese companies enter the market as part of the Pakistan-China development corridor (World Bank, 2017). Pakistan's turbulent manufacturing sector presents an ideal context to study the antecedents of DSCCs.

The remainder of the paper is divided into four sections. The next section discusses the relevant literature and establishes the theoretical underpinnings for our hypothetical model. Section 3 provides a justification of the research design. Section 4 discusses the findings from the study, and Section 5 concludes by outlining the study's contribution to theory and managerial practice, the limitations of the study and future directions for research.

2. Literature Review and Hypothetical Model

2.1 Dynamic Capabilities View

The dynamic capabilities view provides the theoretical underpinnings for our research. The concept of dynamic capabilities is grounded in resource-based theory, which suggests that in addition to rare, valuable, inimitable, and non-substitutable (VRIN) resources (Barney, 1991), firms require dynamic capabilities to succeed in turbulent environments (Teece et al., 1997). Dynamic capabilities are defined as "a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness" (Zollo & Winter, 2002, p. 340). Organisations learn when employees make mistakes and acquire knowledge from these experiences (Collis, 1994; Zollo & Winter, 2002). Deliberate learning efforts, based on the selection and retention of knowledge, become routinized over time as new information is stored in an organisation's procedural memory (Gavetti & Levinthal, 2000; Zollo & Winter, 2002). As an organisation develops the capability of 'learning-to-learn', it is better able to sense new market opportunities through R&D and horizon scanning activities (Teece, 2007). A learning culture allows employees to quickly accumulate knowledge through experiential learning and apply this new

knowledge to seize on emergent opportunities (Teece et al., 1997). Deliberate learning routines allow managers to continuously transform the firm's tangible and intangible assets to remain competitive in turbulent environments (Teece, 2007). Dynamic capabilities emerge when the intention is to stimulate internal change in a firm's resource base to achieve fit with the external environment (Teece, 2007; Teece et al., 1997).

The discourse surrounding dynamic capabilities has been primarily confined to the competitiveness of firms (Schilke et al., 2017). Although often under-emphasized in the literature, the dynamic capabilities view also encompasses alterations to the firm's external environment (Helfat & Winter, 2011; Teece, 2007). Indeed, Teece (2007) stresses the importance of broad-based external search and the subsequent integration of customers and suppliers. He argues that if suppliers of new technology do not succeed in properly understanding customer needs, it is unlikely that the new products they develop will be successful. He stresses that the combination of knowledge within the enterprise and between external organizations is important in the development of dynamic capabilities (Teece, 2007, p. 1339).

Helfat and Winter (2011) discuss the notion of external integrative capabilities that enable communication and coordination between organisations. Integration occurs by facilitating shared activities that produce economies of scope across stages of production or product lines (Helfat and Winter, 2011; Zhu et al., 2018). External integrative capabilities make change possible by coordinating design and manufacturing activities with suppliers such as during the new product development process (Clark & Fujimoto, 1991; Handfield et al., 1999). Possessing integrative capabilities enables firms to absorb knowledge from supply chain partners as part of a process of continuous learning (Wu & Ragatz, 2009). Integrative capabilities become dynamic capabilities when the intended use is to stimulate change in the external marketplace, such as during the launch of a new product to alter customer demand

patterns (Gutierrez-Gutierrez et al., 2018; Helfat and Winter, 2011). The importance of integrating suppliers as part of a coordinated response to marketplace shifts is discussed in an emergent literature on dynamic supply chain capabilities (Aslam et al., 2018; Defee & Fugate, 2010; Dubey et al., 2017; Swafford et al., 2006).

2.2 Dynamic Supply Chain Capabilities

An influential paper by Lee (2004) argued that successful companies are those that have agile supply chains that can rapidly respond to short-term demand changes as well as adaptable supply chains that can be reconfigured to address long-term marketplace alterations. Agility is characterized by flexibility and responsiveness and spans organisational structures, processes, and managerial mindsets (Blome et al., 2013; Christopher & Towill, 2000). Supply chain agility therefore extends beyond firm boundaries and requires alignment with customers and suppliers (Blome et al., 2013; Braunscheidel & Suresh, 2009). Swafford et al. (2006) suggest agility is a supply chain-level capability because it allows buyers and suppliers to seize opportunities once they are sensed (Swafford et al., 2006). Other scholars argue that supply chain agility is a fundamental capability needed to endure and flourish in volatile environments (Braunscheidel & Suresh, 2009; Gligor & Holcomb, 2012). Blome et al. (2013) suggest that supply chain agility is a dynamic capability that can positively influence the operational performance of the firm.

Supply chain adaptability has a longer-term orientation and refers to the ability of supply chain partners to reconfigure and transform supply chain design to match anticipated market changes (Ketchen & Hult, 2007; Lee, 2004). Dubey et al. (2017) argue that supply chain adaptability prepares supply chain members to adjust according to the market situation and gain a desired competitive advantage. When agility and adaptability capabilities become integrated between supply chain partners, a complex adaptive system forms (Choi et al., 2001),

which is able to seize new opportunities in the short term, and transform supply chain infrastructure in the longer term to address changes in consumer demand (Whitten et al., 2012). As supply chain agility and adaptability capabilities result from the firm's ability to reconfigure firm-level and supply chain-level resources, they can be positioned as dynamic, supply chain-level capabilities (Blome et al., 2013; Eckstein et al., 2015; Whitten et al., 2012).

Yet, supply chain partners cannot seize marketplace opportunities if these opportunities are not sensed in the first place. Day (1994) argues that market-driven firms are distinguished by an ability to sense events and trends in their markets ahead of the competition. These firms can anticipate more accurately the responses to actions designed to retain or attract customers, improve channel relations or outmaneuver the competition (Day, 1994 p. 44). Market sensing is considered a capability because managers are able to sense new opportunities by following a sequence of information processing activities used to stimulate organizational learning (Day, 1994; Fiol & Lyles, 1985). The learning process involves gathering new information about trends, events, opportunities and threats in the market environment, absorbing that knowledge into the firm and then reconfiguring knowledge resources in light of the new information (Day, 1994; Fiol & Lyles, 1985). To sense new opportunities, managers undertake horizon scanning activities, which involve reviewing trade magazines, attending conferences and speaking with suppliers and customers to identify new trends and technological breakthroughs (Cousins et al., 2011). Integrating suppliers in horizon scanning increases the activity's breadth and depth, helping the firm to identify promising innovations and allowing new information to be absorbed (Brandon-Jones and Knoppen, 2018; Cousins et al., 2011). Such market sensing activities allow supply chain partners to develop the structures, technologies and policies needed to respond to market changes in an efficient manner (Ngai et al., 2011). Market sensing becomes a dynamic capability, when the intended use is to affect change within the firm's tangible and intangible assets, such as absorbing novel technological information when

developing new products (Bharadwaj & Dong, 2013). Market sensing becomes a dynamic supply chain capability when supply chain partners actively scan the market for new knowledge and innovation and use this information to alter the supply chain's resource base (Aslam et al., 2018; Tse et al., 2016).

Collectively, market sensing, supply chain agility and supply chain adaptability act as a coherent cluster of DSCCs because they allow supply chain partners to *sense* new market opportunities, to *seize* these opportunities in the short term, and to *transform* supply chain resources in the longer-term to match anticipated marketplace changes (Aslam et al., 2018). An emergent body of literature has found a positive relationship between the development of DSCCs and firm performance. For example, Ju et al. (2016) found that DSCCs positively influence technological innovation and operational performance. Other authors have found that DSCCs positively influence the sustainability of supply chains (Beske, 2012; Beske et al., 2014; Hong et al., 2018). Beske (2012) found that DSCCs can enhance a firms sustainability performance through the protection of rare resources and their inimitability by building long-term relationships and trust with supply chain partners. Two years later, Beske et al. (2014) argued that DSCCs improve a firms environmental and social performance by enhancing the transparency and traceability of supply chain practices. In a somewhat contradictory study, Hong et al. (2018) found that DSCCs positively affect a firm's environmental performance, but have no effect on social and economic performance. While this literature has examined performance implications, it has yet to identify the strategic orientations and managerial mind-sets that underpin the emergence of DSCCs. We now turn our attention to the entrepreneurial orientation and supply chain learning literature to gain insights on how these constructs can support the development of DSCCs.

2.3 Entrepreneurial Orientation and Dynamic Supply Chain Capabilities

Teece (2007) suggests that firms with strong dynamic capabilities are intensely entrepreneurial. He argues that the ability of management to identify opportunities for investment in co-specialized assets (i.e. complementary, value-enhancing assets) is fundamental to dynamic capabilities (Teece, 2007). In particular, the decision on when and how to invest depends on management's entrepreneurial capacities with respect to matching up and integrating relevant co-specialized assets (Teece, 2007, p. 1338). Entrepreneurially oriented managers are able to match co-specialized assets by absorbing innovative technologies into the firm and matching it to suitable knowledge sets possessed by operational staff (Sahi et al., 2019). Entrepreneurial orientation is a strategic orientation that captures the specifically entrepreneurial aspects of firms' strategies (Covin & Slevin, 1989; Hakala, 2011; Wiklund & Shepherd, 2005). The predominant view of what it means to be entrepreneurial is an organizational tendency toward concurrently taking risks, continuously innovating to rejuvenate the firm's market offering and being more proactive than the competition (Gupta et al., 2014; Miller, 1983). Indeed, entrepreneurial orientation is defined as the "processes, structures, and behaviours of the firm that are characterised by innovativeness, pro-activeness, and risk-taking" (Stam & Elfring, 2008, p. 98).

Innovativeness refers to a willingness to introduce newness and novelty through experimentation and creative processes aimed at developing new products and services (Dess & Lumpkin, 2005). Yet, innovative ideas do not always originate from within firm boundaries but often stem from external sources, such as suppliers (Bidault et al., 1998; Powell et al., 1996). Entrepreneurial managers that can extend market scanning activities beyond firm boundaries, to include suppliers, are better able to identify promising innovations, and can absorb this information and match it with the knowledge assets of employees (Bharadwaj and Dong, 2013; Cousins et al., 2011). The foundation for dynamic capabilities is set when a

manager combines innovative assets with the knowledge resources of the firm to achieve fit with the changing business environment (Teece et al., 1997). When these innovative ideas stem from suppliers and are matched with the knowledge assets of the firm, the foundation is set for dynamic supply chain capabilities to emerge.

Pro-activeness refers to a firm's forward-looking behaviour and its efforts to gain the first mover advantages that shape the marketplace by introducing new products (Lyon, Lumpkin, & Dess, 2000). Pro-activeness in the supply chain refers to how supply chain partners identify market opportunities and seize such opportunities to shape the business environment (Gligor & Holcomb, 2012; Lumpkin & Dess, 1996; Wang, 2008). Proactive supply chain partners can achieve first-mover advantages by bringing innovative products to market before the competition (Dess & Lumpkin, 2005; Lieberman & Montgomery, 1988). Pro-activeness requires the accurate sensing of shifts in the marketplace and developing corresponding action plans (Dai et al., 2016). Proactive supply chain partners can develop systems to monitor market trends, sense future customer needs, and predict changes in marketplace demand (Dess & Lumpkin, 2005). Thus, pro-activeness gives managers the ability to sense and seize a marketplace opportunity before the competition, leading to long-term competitive advantages (Dess & Lumpkin, 2005).

Risk is often described in the supply chain literature as something to be managed and avoided (Braunscheidel & Suresh, 2009; Chopra & Sodhi, 2004). Yet, risk aversion leads to organisations becoming trapped in established routines and decision-making patterns (Lumpkin & Dess, 1996). Entrepreneurial organisations are those that are willing to take calculated risks on innovation and reconfigure their resource base to seize new market opportunities (Dess & Lumpkin, 2005; Grühn et al., 2017; Teece, 2007). Risk-taking entails devoting more resources to projects that have uncertain outcomes, and entering new markets to seize emergent opportunities (Lumpkin & Dess, 1996). Entrepreneurially-oriented managers

that are open to taking risks foster an organisational setting where employees have the freedom to make, and learn from, mistakes (Hamel & Prahalad, 1990; Slater & Narver, 1995; Wang, 2008). Instead of avoiding risks altogether, proactive firms embrace risk by developing agile supply chain processes that enable a flexible response to changing marketplace conditions (Braunscheidel & Suresh, 2009; Grötsch et al., 2013).

Entrepreneurial orientation can therefore be understood as a learning mind-set, where individuals are keen to acquire knowledge through Research and Development (R&D) activities and the co-development of innovative technologies with suppliers. Newly acquired knowledge can be codified in standard operating procedures and trained out across the organisation and wider supply chain (Cousins et al., 2011). Over time, the pattern of continuous learning becomes routinised between supply chain partners, leading to the emergence of 'learning-to-learn' dynamic capabilities (Collis, 1994; Zollo et al., 2002; Zollo & Winter, 2002). Integrating with suppliers and co-developing an orientation towards continuous learning sets the foundation for dynamic, supply chain-level capabilities. DSCCs give supply chain partners greater capacity and scope to sense new market opportunities (market sensing), to seize on new opportunities as they arise (supply chain agility), and to collaborate to transform supply chain design and infrastructure in response to marketplace shifts (supply chain adaptability). Drawing together this line of reasoning, we hypothesize that an entrepreneurial orientation will positively affect the emergence of dynamic supply chain capabilities:

> H1: *An entrepreneurial orientation will have a positive and direct influence on the emergence of dynamic supply chain capabilities.*

2.4 Supply Chain Learning Orientation and Dynamic Supply Chain Capabilities

Learning is a strategic orientation that refers to the organization-wide activity of creating and using knowledge to enhance competitive advantage (Calantone et al., 2002; Hakala, 2011). A learning orientation is evidenced when managers obtain and share information about customer

needs and market changes as well as developing novel technologies to create new products that are superior to the competition (Baker & Sinkula, 1999; Hurley & Hult, 1998). A learning orientation supports the emergence of capabilities because it reflects an organization's capacity to change its view of the world by unlearning obsolete perspectives, systems and procedures, and proactively replacing them with approaches that are capable of creating and maintaining competitive advantage (Baker & Sinkula, 1999; Day, 1994). Learning is therefore a fundamental part of the capability development process; a process that operates at various levels of the firm, passing from individuals, to functions, to encompass the entirety of the supply chain (Gupta et al., 2014).

A supply chain learning orientation refers to the mind-set of the firm, its customers, and suppliers in managing the learning process in relation to emergent supply chain issues (c.f. Flint et al., 2008). An inability or unwillingness to share knowledge between supply chain partners is cited as the primary barrier for achieving shared responsibility when satisfying changing customer requirements (Thomas et al., 2011). Common interests and interdependence between buyers and suppliers provides the motivation for experience and knowledge sharing across the supply chain (Bessant et al., 2003; Gong et al., 2018). Learning from supply chain partners encourages firms to embrace new knowledge and integrate this information with its own intelligence (Flint et al., 2008; Spekman et al., 2002). As buyers and suppliers experiment with new technologies and learn by failing, new knowledge is gained (Zollo et al., 2002). Repetitive collaboration and cooperation between supply chain partners creates a learning orientation in the buyer-supplier team (Hult et al., 2003; Rojo et al., 2018). The experiential learning that occurs between supply chain partners can be stored in institutional memory to encourage a continuous cycle of knowledge accumulation (Ireland & Webb, 2007; Ojha et al., 2016).

Regular patterns of interaction between buyers and suppliers permits the transfer, recombination and creation of specialised knowledge (Dyer & Nobeoka, 2000). Knowledge sharing between supply chain members promotes learning resources to be targeted toward the discovery of innovative, value-added capabilities (Defee & Fugate, 2010). Over time, the repetitive sharing of knowledge and integration between supply chain partners leads to the emergence of 'learning-to-learn' capabilities (Ojha et al., 2018; Ojha et al., 2016). This process of continuous learning is facilitated by repetitive horizon scanning activities between supply chain partners (Cousins et al., 2011). By integrating the firm's market sensing capability with suppliers, new opportunities can be identified and seized in the short-term (supply chain agility). In the longer-term, learning with supply chain partners facilitates the transformation of supply chain design and infrastructure to achieve alignment with shifting customer demand (supply chain adaptability). We therefore hypothesize that a supply chain learning orientation will lead to the emergence of dynamic supply chain capabilities:

> H2: *A supply chain learning orientation will have a positive and direct influence on the emergence of dynamic supply chain capabilities.*

2.5. Entrepreneurial Orientation - DSCCs and the mediating role of a Supply Chain Learning Orientation

Previous studies have argued that an entrepreneurial orientation may be a necessary but insufficient condition in explaining how firms compete in turbulent environments (Wang, 2008; Zhao et al., 2011). For example, some studies find that entrepreneurial orientation positively influences how firms function in relation to the competition (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005), while other studies are unable to find a direct, and positive, correlation (Smart & Conant, 1994; Tang et al., 2008). One group of scholars suggests the reason for these differing accounts is the missing role of organisational learning in the

entrepreneurial orientation-competitive performance relationship (Alegre & Chiva, 2013; Real et al., 2014; Toutain et al., 2017; Wang, 2008). An increasing number of studies have found that firms with a well-developed entrepreneurial orientation consider learning an important source of competitive advantage (Zhao et al., 2011). For example, Miller (1983) argued that an entrepreneurial posture shapes a firm's learning competencies because it institutionalises the pursuit of innovation and learning, and minimises change resistance through openness in knowledge sharing (Bierly et al. 2009). A higher level of entrepreneurial orientation is said to correspond to a firm's ability to learn about innovative ideas, introduce new products and services, and experiment with new resource combinations in pursuit of success (Li et al., 2011).

Other studies have found that firms with high levels of entrepreneurial orientation have a higher propensity to acquire and utilise marketplace information (Anderson et al., 2009; Hughes et al., 2007; Keh et al., 2007; Sapienza et al., 2005; Spekman et al., 2002; Zhao et al., 2011). For example, an empirical study by Sapienza et al. (2005) concluded that entrepreneurial orientation is positively associated with an organisational culture that encourages learning efforts. In similar studies, Anderson et al. (2009) and Bierly et al. (2009) found that entrepreneurial orientation has a significant impact on the exploration element of knowledge acquisition. Kreiser (2011) summarised these arguments saying that all three dimensions of entrepreneurial orientation (innovation, risk-taking and pro-activeness) facilitate learning. Specifically, innovativeness makes a firm more receptive to new information, risk-taking enhances the willingness of managers to face uncertain situations, and pro-activeness encourages managers to acquire and integrate new information in the quest to develop and maintain a competitive edge (Kreiser, 2011).

Importantly, an entrepreneurial orientation does not just encourage learning behaviour within the firm, but can stimulate learning amongst supply chain partners (Handfield et al., 2009; Marshall, McCarthy et al., 2015; Ojha et al., 2016). Entrepreneurially-oriented managers

engage in closer relationships with suppliers to sense and seize untapped opportunities, and then transform the supply chain in response (Marshall et al., 2015). Moreover, entrepreneurial managers take proactive actions to learn about their supply chain partners in the quest to outperform their rivals (Lumpkin & Dess, 1996). An entrepreneurial orientation fosters a culture of learning that allows supply chain partners to build dynamic capabilities and capitalise on market opportunities quicker than rivals (Zhao et al., 2011). Based on this line reasoning, we explore the mediating effect of a supply chain learning orientation on the relationship between entrepreneurial orientation and DSCCs:

> H3*: A supply chain learning orientation mediates the relationship between entrepreneurial orientation and dynamic supply chain capabilities.*

Our hypothetical model (see Figure 1) depicts the relationship between the three hypotheses. In the next section, we provide a justification for the research design and the steps taken to test the hypothetical model (see Figure 1).

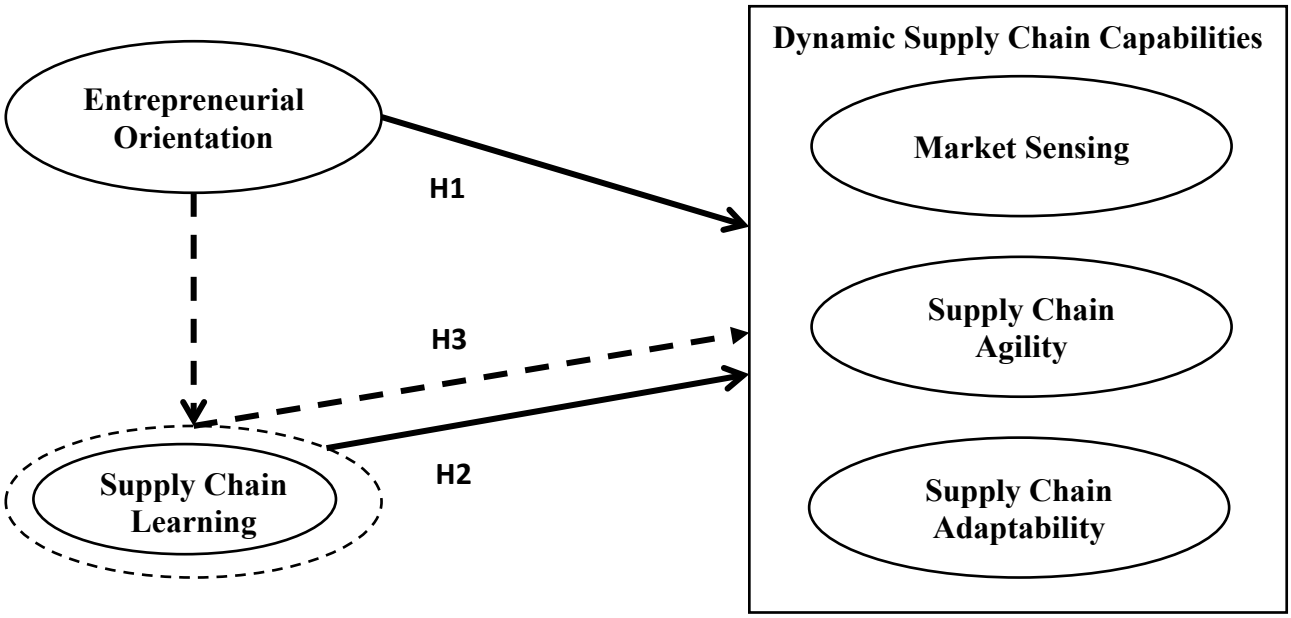


Figure 1: Hypothesised Model

3. Research Design

We adopt a positivist ontology as we believe that the major constructs of this study (i.e. entrepreneurial orientation, supply chain learning orientation, DSCCs) are real and not subject to social construction. Our underlying epistemology is that these constructs can be quantitatively measured, and we do so using a survey design. As we are testing hypotheses that are informed by an existing theory (dynamic capabilities) we adopt a deductive research approach (Reyes, 2004). Previous studies on DSCCs have adopted a similar positivistic ontology and deductive approach to examine a set of theoretically informed hypotheses, which allowed for the generalisability of results (Blome et al., 2013; Eckstein et al., 2015; Swafford et al., 2006).

We adopt the firm as the unit of analysis and Pakistan's manufacturing sector as the context of study. Pakistan proves a suitable context to study the antecedents of DSCCs because businesses in this country are experiencing a turbulent period of economic growth and social change (World Bank, 2017). Over the next ten years, Pakistan's gross domestic product (GDP) is expected to grow at a rate of 6% per year, far outperforming countries in Europe and North America (Zahid, 2017). Furthermore, due to the establishment of the China-Pakistan Economic Corridor (CPEC), Pakistani businesses expect to see intensified competition from Chinese firms in the coming decade. These factors mean that businesses operating in Pakistan's fast growing manufacturing sector are building dynamic supply chain capabilities to sense market changes, seize new opportunities, and continuously transform supply chain structures to adapt to marketplace shifts.

3.1. Data collection methods

Our study used a single respondent design. Some researchers have raised concerns with the efficacy of this design (e.g. Flynn et al., 2018). However, Montabon, Daugherty, and Chen

(2018) suggest that single-informant surveys are still vital in supply chain research. They suggest that it is more valuable to gather data from a single knowledgeable respondent than multiple respondents without relevant knowledge. Following their advice, we made an effort to increase the sample size to improve representativeness and generalizability.

Data were collected using a survey method. Invitations to complete the survey were sent to managers working in operations and supply chain management positions in Pakistan's manufacturing sector. Hoskisson et al. (2000) identified a number of issues when collecting empirical data from emerging economies. These included: difficulty in collecting random and representative samples; (low) postal system reliability; lack of trust between the respondents and researcher; difficulty in gaining access to top management: and a lack of understanding of common management issues among practicing managers. Other studies conducted in emerging economies have reported similar issues (e.g. Ahmad et al., 2009; Ali et al., 2012; Dubey & Gunasekaran, 2016; Jeswani et al., 2008; Kureshi et al., 2010; Ryan & Tipu, 2013; Singh et al., 2010). For example, Malik and Kotabe (2009) collected data from seven cities in India and Pakistan using convenience sampling, and could not find an up-to-date list of firms operating in each country. Other studies in India and Pakistan have not used probability sampling methods for similar reasons (e.g. Ali et al., 2012; Jeswani et al., 2008; Ryan & Tipu, 2013)

Similar to these studies, we found data collection in Pakistan to be a challenging affair. For example, when preparing the survey instrument, we had difficulty locating a comprehensive database of companies operating in Pakistan's manufacturing sector. To overcome this challenge, we compiled a list of manufacturing companies to be included in the sampling frame using Pakistan's stock exchange, lists of managers' names provided from the Quality and Productivity Society of Pakistan, the yellow pages, as well as websites of manufacturing trade associations. Where possible we included the names and e-mail address of supply chain and operations managers working in these companies in the list. We sent

multiple waves of e-mails to these managers between February and July 2016. We attached the survey instrument and a cover letter to the email; these introduced the research and the importance of the respondent cooperating in the study. Discounting the e-mails that went undelivered due to incorrect or obsolete e-mail addresses, we sent out 3,375 e-mail surveys. In total, we received 275 usable responses (8.1% response rate), which is in line with similar studies in emerging economies (e.g. Ali et al., 2012; Jeswani et al., 2008; Ryan & Tipu, 2013): however, the response rate does come with some non-response bias issues.

We tested for non-response bias by using the method suggested by Armstrong and Overton (1977). This method compares early and late respondents while using late respondents as a proxy for non-respondents (Braunscheidel & Suresh, 2009; Brusset, 2016; Schoenherr & Swink, 2015; Whitten et al., 2012). Comparisons between early and late respondents were made on the basis of three demographic variables: 1) the sales revenue of the respondent's firm; 2) the number of years that the respondent's firm had been in operation; and, 3) the experience of the respondent using independent sample t-tests. The results showed no significant difference between the two groups. The distribution of firms in the sample closely resembles the distribution of local industry according to the Pakistan Bureau of Statistics (Pakistan Bureau of Statistics, 2005-06). For example, 25.1% of the respondents belonged to the textile sector; a sector that contributed 26.2% to Pakistan's GDP in 2018. Similarly, 17% of respondents were from the Fast Moving Consumer Goods sector (FMCG); an industry that contributed 16.5% to GDP; 4.3% of respondents were from auto and auto-part manufacturing, and contributed 5.4% to GDP; 10.8% of respondents belonged to chemical manufacturing, and contributed 12% to GDP; and 2.9% were from the electronics industry and contributed 1.8% to GDP. The industry and respondent profiles are provided in Tables 1 and 2.

Insert Table 1 & 2 about here

3.2. Measures

Following the advice of Schminke (2004), we developed our scale measures based on scales from existing studies. To identify relevant scales, we conducted an in-depth literature review and found scales that demonstrated suitable reliability and validity. As the variables of interest in this study (entrepreneurial orientation, supply chain learning orientation, dynamic supply chain capabilities) cannot be obtained from annual reports or financial statements, we instead used perceptual measures to collect data from respondents. Ketokivi and Schroeder (2004) highlight the difficulty of drawing causal inferences based on perceptual measures for performance. They also detail the problems arising out of using such measures in surveys. However, their empirical results showed that use of perceptual measures is warranted in survey research. The literature also indicates a high correlation between subjective and objective measures of variables (Protogerou et al., 2012), suggesting that perceptual measures would be suitable for our purposes. In the following section, we provide greater detail on the scales and measures used in the study.

Entrepreneurial Orientation (EO): The EO scale was adopted from the study by Jantunen et al. (2005); this study was based on pro-activeness, risk-taking, and innovativeness items developed in Covin and Slevin (1988) and Miller and Friesen (1982). All items were measured on a 7-point scale, with 1 representing “strongly disagree” and 7 representing “strongly agree”.

Supply Chain Learning Orientation (SCLO): The SCLO scale was adopted from Flint et al. (2008) and consisted of six items measured on a scale of 1 (strongly disagree) to 7 (strongly agree). These items measured the orientation of managers towards learning within the organization (Flint et al., 2008; Ojha et al., 2018; Spekman et al., 2002; Willis et al., 2016) as well as with suppliers (Bessant et al., 2003; Flint et al., 2008; Willis et al., 2016) and customers (Flint et al., 2008; Willis et al., 2016).

Dynamic Supply Chain Capabilities (DSCC): DSCCs in this study were measured as a second-order reflective construct consisting of sensing, seizing and transforming capabilities. In accordance with Aslam et al. (2018), we consider market sensing to be a sensing capability, supply chain agility to be a seizing capability, and supply chain adaptability to be a transforming capability. In combination, these three capabilities form a cohesive bundle of dynamic supply chain capabilities (Aslam et al., 2018). This is in line with previous empirical studies that have tested relationships about dynamic capabilities (Protogerou et al., (Brandon-Jones and Knoppen, 2018)2012; Wang et al., 2015). Details of the scales for each component of DSCCs are as follows:

- ***Market Sensing Capability (MSC):*** The MSC scale is adopted from Morgan et al. (2009) and consists of five items measured on a scale of 1 (strongly disagree) to 7 (strongly agree). The scale elicited data on the efforts of the firm aimed at learning about customer needs, competitor strategies, distribution channels, market trends, and the broader market environment. The scale was selected because it elicited data on the efforts of the firm aimed at learning about customer needs, competitor strategies, distribution channels, market trends, and the broader market environment (Day, 1994; Teece, 2007).
- ***Supply Chain Agility (SAG):*** The SAG scale is based on the study by Blome et al. (2013). It consisted of five items measured on a scale of 1 (strongly disagree) to 7 (strongly agree). In line with the research in area of SAG (Al-Shboul, 2017; Dubey et al., 2018; Qrunfleh & Tarafdar, 2013; Fosso Wamba and Akter, 2019) the items of this scale measure the ability of the firm to handle demand-side and supply-side changes in a timely manner.
- ***Supply Chain Adaptability (SAD):*** The SAD scale is based on the supply chain adaptability construct from Lee's (2004) Triple-A supply chain. It consists of a five

item scale developed in the Whitten et al. (2012) study and further validated in Aslam et al. (2018) and Dubey et al. (2018), and is measured on a scale of 1 (strongly disagree) to 7 (strongly agree).

3.3. Common Method Bias

We took pre-emptive procedural remedies to avoid common method bias. Common method bias occurs when a similarity in measurement technique results in biased estimates for reliability and validity; it can result in imprecise estimations of relationships between variables of interest (Green et al., 2016). To address common method bias, we followed the guidelines suggested by Conway and Lance (2010) and Podsakoff et al. (2003). We placed dependent and independent variables in different sections of the survey and with different Likert-type scales; for example, strongly disagree-strongly agree versus far better-far worse. Furthermore, we reassured the respondents about confidentiality and anonymity, and gave them the option to submit the response without filling in their name or their company's name. The survey instrument was refined using two rounds of pilot surveys and qualitative expert opinions to remove any ambiguities that could possibly bias the respondents.

To statistically test for common method bias, we used a common latent factor approach (MacKenzie & Podsakoff, 2012). According to this approach, a common factor was linked to all the variables in the final research model to account for variation due to common method (Kortmann et al., 2014). A difference in the goodness of fit (GOF) measures would indicate the existence of method bias. The results showed the GOF measures improved slightly (χ^2 = -0.16, CFI = 0.013, RMSEA = -0.007) with statistically significant chi-square difference. Based on this evidence, the remaining analysis was performed while keeping the method factor to account for common method bias.

3.4. Endogeneity

Before testing the hypothesized model, we tested for endogeneity of the exogenous variable (Ketokivi & McIntosh, 2017). In our research model, entrepreneurial orientation is conceived as a variable exogenous to DSCCs in the sense that entrepreneurial orientation shapes DSCCs but it is not true the other way around (Zahra et al., 2006). Therefore, endogeneity is not expected to be a concern in this context. However, in order to empirically rule out the possibility of endogeneity, we applied the Durbin-Wu-Hausman test (Davidson & MacKinnon, 1993). We used the methodology suggested by Dong, Ju, and Fang (2016) in the Journal of Operations Management. We first regressed entrepreneurial orientation on the control variables and then considered the residual of this regression as an additional regressor in our hypothesized model. The estimate for the residual was not significant in our model, indicating that entrepreneurial orientation was not endogenous in our model.

3.5. Assessment of Psychometric Properties

In order to validate the measurement model, confirmatory factor analysis (CFA) was run based on all first-order factors. Model fit indices ($\chi^2 = 1.62$, $p > 0.05$, GFI = 0.90, CFI = 0.96 and RMSEA = 0.047) showed a good fit (Hu & Bentler, 1999). Factor loadings for all the constructs were either close to or above 0.7, and average variance extracted (AVE) for each construct was higher than 0.5 (Fornell & Larcker, 1981). In combination with significant p-values, this indicates a suitable level of convergent validity.

Discriminant validity was established by comparing the AVE with maximum shared variance (MSV) for each construct. MSVs of the constructs were less than AVEs, providing evidence of discriminant validity (Kumar et al., 2018; Liu et al., 2018). Furthermore, bi-variate correlations were compared with the square root of AVE (Fornell & Larcker, 1981). According to this criterion, if the correlation between a pair of constructs is less than AVE, discriminant

validity is established. Table 3 provides AVEs and MSVs for all the constructs. Table 4 shows that correlations between all pairs of constructs are less than the associated square-roots of AVEs, indicating discriminant validity. Table 4 also provides means and standard deviations (SD) for the constructs in the study.

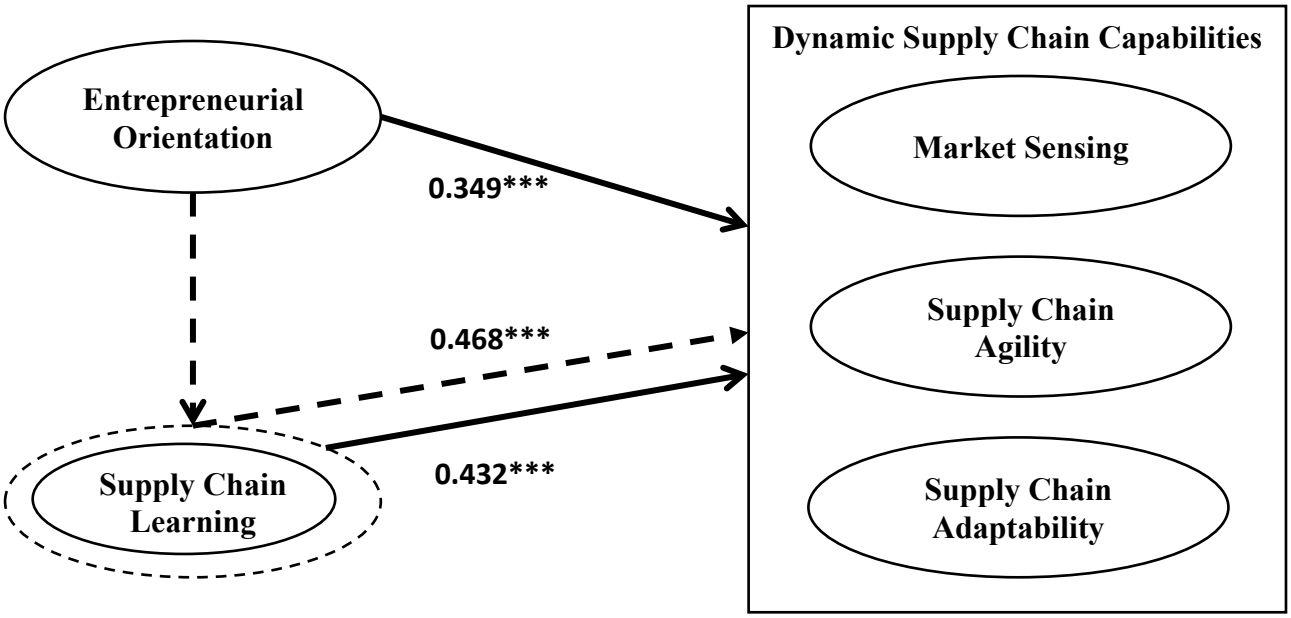
Cronbach's alpha coefficient was used to estimate the reliability of the constructs. Alpha coefficients for all the constructs were greater than 0.7, indicating reliability of the constructs. After validating the first-order factor model, a second-order factor model was created for the dynamic supply chain capabilities. It did not show any deterioration in the GOF measures, indicating the suitability of the second-order factor. Table 3 provides the information about factor loadings (first-order and second-order factor), AVE, and reliability measures for the constructs in the study.

Insert Table 3 & 4 about here

Before testing our hypotheses through structural equation modelling, we tested the assumptions of normality, linearity, constant variance, and existence of outliers. Normality assumption was tested through residual plots by predicted values, Rankit plots of residuals, and univariate statistics of skewness and kurtosis. Mahalanobis distances were used to estimate the multivariate outliers. The maximum absolute values of skewness and kurtosis were well within the acceptable limits (0.61 and 0.90 respectively) (Curran et al., 1996). Furthermore, the plots did not point towards any significant cause for concern in terms of deviations from normality and homoscedasticity. We tested multi-collinearity through variance inflation factors (VIFs) of the independent variables. Since the VIFs were below 4, which is well below the recommended threshold of 10, we concluded that multicollinearity was not a problem (Hair et al., 2014). Finally, the scatter plots between independent and dependent variables indicated a strong linear relationship, hence the linearity assumption was also met.

4. Findings and Discussion

In this paper, we set out to test how an entrepreneurial orientation and supply chain learning orientation affect the emergence of DSCCs. We hypothesised that entrepreneurial orientation (H1) and supply chain learning orientation (H2) positively affect the emergence of DSCCs. We also studied the mediating role of supply chain learning on the relationship between entrepreneurial orientation and DSCCs (H3). We used structural equation modelling (SEM) to test the hypotheses. Figure 2 provides the results of the SEM analysis. Model fit was found to be adequate ($\chi^2 = 1.46$, $p > 0.05$, GFI = 0.92, CFI = 0.97 and RMSEA = 0.041). The results show that entrepreneurial orientation has a significant impact on dynamic supply chain capabilities ($\beta = 0.349$, $p < 0.01$). Thus, H1 is supported. Furthermore, the relationship between supply chain learning and dynamic supply chain capabilities is also significant ($\beta = 0.432$, $p < 0.01$). Therefore, H2 is also supported. In order to test the mediation hypothesis (H3), imputed variables from the structural analysis were used. We used a bootstrapping technique (Hayes, 2009, 2013) with 5,000 bootstrap samples with 95% bootstrap confidence interval to test the significance of indirect effect. Results showed that supply chain learning significantly mediates the relationship between an entrepreneurial orientation and DSCCs (β = 0.468, lower confidence limit = 0.360, upper confidence limit = 0.568, $p < 0.01$). Thus, H3 was also supported.



*** p<0.01

Figure 2: Structural Model

The results of the SEM presented in Figure 2 suggest that entrepreneurial orientation positively affects the emergence of DSCCs. However, the weaker direct effect we found, in comparison to the indirect effects, suggests that entrepreneurial orientation may be a necessary but insufficient condition in the emergence of DSCCs. This suggests that the relationship between entrepreneurial orientation and DSCCs is mediated by a supply chain learning orientation. Our results conform to the conclusions of previous studies that show how entrepreneurial orientation utilises learning in knowledge creation and, in combination, learning and entrepreneurial orientation lay the foundation for new capabilities (Real et al., 2014). Our data suggest that the pro-active and innovative nature of a firm's entrepreneurial orientation encourages learning through the sharing of knowledge between supply chain partners, allowing the supply chain to better sense and seize new market opportunities (Anderson et al., 2009).

In identifying a supply chain learning orientation as an outcome of entrepreneurial orientation, we answer the call of Dess et al. (2003) and Zahra et al. (1999) to gather empirical

data on the outcomes of entrepreneurial orientation above and beyond firm performance. By determining how a supply chain learning orientation enables capability building, we also respond to Argote (2012) who called for the identification of different learning outcomes outside of enhanced firm performance. Moreover, our findings lend empirical support to previous studies that have suggested that learning is an antecedent to the success of dynamic capabilities (Kale & Singh, 2007; Lei et al., 1996; Schilke, 2014) and that dynamic capabilities are formed (Zollo et al., 2002) and improved (Huang et al., 2013) through learning orientations.

Our findings extend the work of Defee and Fugate (2010) who suggested that the antecedents of DSCCs are a supply chain orientation and learning orientation. Their notion of supply chain orientation calls on a focal firm and its supplier to undertake cooperative efforts to synchronize intra- and inter-firm capabilities, while adopting a systems approach to view the supply chain holistically. Our suggestion is that a supply chain orientation and a learning orientation should not be treated separately; synchronizing capabilities between supply chain partners is a learning activity in itself, requiring managers with similar mind-sets to share knowledge about supply chain issues. We therefore suggest that a supply chain orientation should be combined with a learning orientation; allowing us to position a supply chain learning orientation as a key antecedent of DSCCs.

Our findings also challenge Defee and Fugate's (2010) assertion that knowledge accessing and co-evolving are the constituent constructs of DSCCs. They suggest that knowledge accessing allows each organisation to quickly understand what partner organizations are capable of accomplishing, while co-evolving allows supply chain partners to realize cross-business synergies (Defee and Fugate, 2010). We argue that accessing supplier knowledge and capitalizing on synergies is actually part of the learning process; a process that antecedes the emergence of DSCCs. Accessing supplier knowledge implies that knowledge is shared, and it is through the sharing of ideas that synergies are identified. It is through this

learning process that the ideas of buyers and suppliers co-evolve, leading to new supply chain configurations. We therefore suggest that knowledge accessing and co-evolving are not actually DSCCs in themselves but form part of a supply chain learning orientation. We side with more recent writings (Aslam et al. 2018; Eckstein et al. 2015; Dubey et al. 2018), and position market sensing, supply chain agility and supply chain adaptability as a cohesive cluster of DSCCs.

5. Contribution, Limitations and Future Research Directions

5.1 Theoretical Contribution

Scholars have shown that dynamic capabilities allow firms to compete in today's volatile marketplace (Barreto, 2009; Helfat and Winter, 2011). And, a number of studies have identified the antecedents of firm-level dynamic capabilities (Rothaermel and Hess, 2007). Yet, the literature on the theoretical underpinnings of dynamic supply chain capabilities, in particular its antecedents, is still in the nascent stages. The theoretical contribution of this paper is the provision of a roadmap on how to build DSCCs by determining the key antecedents. Gaining such an understanding is vitally important in an era where supply chains compete for market dominance. Our contribution rests on identifying that dynamic, supply chain-level capabilities emerge when entrepreneurially oriented managers match the knowledge assets of suppliers with a firm's internal knowledge resources through a process of supply chain learning. Our findings suggest that supply chain partners learn through trial-and-error experimentation, such as during the development of new products, and gain experience by taking risks during the process (Gavetti & Levinthal, 2000; Lumpkin & Dess, 1996). Over time, this process of continuous learning allows for new market opportunities to be sensed and for supply chain assets to be reconfigured and transformed to seize on new market opportunities. This paper

therefore contributes to literature development by opening up a new research domain on the relationship between strategic orientations and dynamic, supply chain-level capabilities.

Schilke et al. (2017) identified that the current literature has not examined in sufficient depth the additional mechanisms (i.e. mediators) that explain the proposed relationships between dynamic capabilities and other variables. While we hypothesised that entrepreneurial orientation positively, and directly, affects first-order DSCCs, our data indicate that a supply chain learning orientation mediates this relationship. This suggests that an entrepreneurial orientation is needed in the first instance in order to encourage knowledge sharing between supply chain partners. Therefore, our study makes an important theoretical contribution because it identifies a supply chain learning orientation as a mediating variable on the relationship between entrepreneurial orientation and the emergence of DSCCs. Our findings suggest that entrepreneurially oriented managers will require a mind-set of learning with supply chain partners to sense and seize market opportunities, and reconfigure the supply chain resource base in response.

5.2 Managerial Contribution

In an era of increasing market turbulence, managers need instruction on how to build dynamic supply chain capabilities in order to remain competitive. This research is important because it gives managers a roadmap showing how to build DSCCs, starting with fostering an entrepreneurially-oriented mind-set in the company and then learning with supply chain partners. We find that an entrepreneurial orientation encourages manager to take risks, and co-develop innovative ideas with supply chain partners as part of the learning process. Proactively searching the supply chain for innovative supply chain partners allows managers to keep abreast of the latest technologies and process approaches. A continuous loop of learning-to-learn allows supply chain partners to gain experience and share this experience in order to

tackle difficult supply chain problems as they arise. Importantly, managers should acknowledge that solely concentrating on knowledge acquisition within the boundaries of their firm can lead to a power imbalance, putting suppliers at a disadvantage (see Defee & Fugate, 2010).

5.3 Research Limitations and Future Research Directions

The results of this study may be interpreted in light of its limitations: these limitations may also open up some avenues for future research. Although we propose causal relationships in the research model, the cross-sectional nature of our data limits the causal inference. Therefore, although our results point towards the causal logic of the relationships, these cannot be taken as conclusive evidence of causal relationships. For conclusive evidence, longitudinal studies should be conducted in future. Another limitation that is an integral part of most social science research (and this study as well) is the use of perceptual measures to operationalise constructs. This was mainly due to the unavailability of objective information related to research variables. Although we took great care during the design phase of the study and also adjusted for the common method bias in the results, we recognise that we cannot claim our study to be totally free from common method bias. As suggested by Ketokivi and Schroeder (2004) and Guide and Ketokivi (2015), such a claim cannot be true in a single-key informant based survey research .

We also acknowledge that this study used a firm-level description of entrepreneurial orientation. Future researchers should look to extend our understanding of entrepreneurial orientation to the supply chain to better understand the foundations of dynamic supply chain capabilities. Future researchers could extend our study by gathering empirical data on the role of DSCCs in shaping the external business environment. Topics of interest may include how DSCCs allow supply chain members to sense and respond to supply chain disruptions including

natural disasters, political upheavals and environmental catastrophes. Future researches may also want to examine how DSCCs allow supply chain members to enter new markets and launch innovative products to influence consumer demand and alter external market conditions. Finally, this study has identified supply chain learning as one mediating variable in the relationship between entrepreneurial orientation and DSCCs. We call on future researchers to investigate the effects of other variables such as supply chain orientation (Defee and Fugate, 2010), innovation orientation (Stock and Zacharias, 2011) and technological innovation (Ju et al., 2016) on the emergence of DSCCs.

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